A NEW SPECIES OF BROAD-HEADED *ELEUTHERODACTYLUS* FROM THE CORDILLERA OCCIDENTAL OF COLOMBIA (AMPHIBIA, LEPTODACTYLIDAE)

By

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SUMARIO

Se describe *Eleutherodactylus cadenai* sp. nov. de las selvas de la vertiente occidental de la Cordillera Occidental de Colombia (corregimiento de Murrí, Municipio de Frontino, Antioquia). La especie parece tener un ancestro común con *Eleutherodactylus ingeri* de los bosques nublados de la Cordillera Oriental de Colombia y las dos tienen parentescos con *Eleutherodactylus ruizi* de las cordilleras Central y Occidental de Colombia.

The broad-headed eleutherodactyline frogs have been studied by Lynch (1975, 1981). Although frogs of this assembly are easily identified (Lynch, 1975, 1976, 1981), the assembly is not a natural group (Lynch, 1986). Recently, Rivero (1984) described a new species, *E. sernai,* from western Antioquia, Colombia. Although Rivero associated *E. sernai* with the *biporcatus* group, the species appears to be a member of the *sulcatus* group (because it possesses the plesiomorphic condition of the mandibular muscles adductors and the trigeminal nerve mandibular ramus. However, this characteristic is not sufficient to place *E. sernai* within the *sulcatus* group; the assignment will be defended in a future paper on the osteology of the various species of the group. For the moment, the *sulcatus* group contains the following species: *E. cerastes* Lynch, *E. cornutus* (Jiménez de la Espada), *E. helonotus* (Lynch), *E. ingeri* (Cochran and Goin), *E. ruizi* Lynch, *E. sernai* Rivero, and *E. sulcatus* (Cope).

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At present, we do not know if the group is monophyletic. In a study of part of the group, Lynch (1981) proposed a series of synapomorphies. However, that hypothesis (or series of hypothesis) was discarded (implicitly) by Lynch (1986) with his proposal that the condition "E" (of the mandibular muscles and the route of the mandibular ramus of the trigeminal nerve) constituted a synampomorphy defining what might be called the subgenus *Craugastor* (which includes one species Lynch considered in his 1981 paper). Within the *sulcatus* group, some synapomorphies proposed by Lynch (1981) remain valid, such as the condition of the otic process of the squamosal and the articulation between the maxilla and the squamosal so that the cheek bone is greatly extended (see page 329 and figure 4A in Lynch, 1981).

In terms of the bony articulations underlying the cheek, *Eleutherodactylus ingeri* is very distinctive. However, in a collection of amphibians made by Rodrigo Bernal and Gloria Galeano, I found an adult individual of a species of broad-headed *Eleutherodactylus* similar to *E. ingeri*. This animal has cheek bones even more extensive than those seen in *E. ingeri* but in other characteristics it differs considerably from *E. ingeri*.

Eleutherodactylus cadenai sp. nov. Fig. 1

HOLOTYPE. Adult female, ICN Nº 13731, collected by R. Bernal and G. Galeano, field number CGB 279, January 8, 1982.

TYPE-LOCALITY. Alto Río Cuevas, carretera Nutibara - La Blanquita, Corregimiento de Murrí, Municipio de Frontino, Departamento de Antioquia, Colombia, 1900 m.s.m.

ETIMOLOGY: Named for my good friend and colleague, Alberto Cadena, who has helped many herpetologists having interests in the Colombian biota.

DIAGNOSIS. A species of the genus *Eleutherodactylus* distinguished from all other species by the following combination of characteristics: head large; skin of venter smooth; upper eyelid tuberculate, one tubercle elongate; fingers and toes with small discs; toes lacking webbing and lateral fringes; cranial crests present between eyes and on temporal region; snout slightly sloping; bones of cheek extended so as to form an articulation between maxilla, quadratojugal, and zygomatic process of the squamosal (Fig. 1); size relatively small (adult female 40.6 mm SVL - snout-vent length).

Eleutherodactylus cadenai is most closely related to *E. ingeri*, which is easily distinguished because the skin of the venter is granular (smooth in *cadenai)* and by the presence of an inner tarsal fold (absent in *cadenai*).

Eleutherodactylus cadenai is most similar (externally) to *E. cerastes, E. cornutus,* and *E. sernai,* but these three have long vomerine odontophores,

cerastes and *cornutus* have tuberculate skin on the dorsum, and *cornutus* has an inner tarsal fold.

DESCRIPTION: Head much broader than long, broader than body; head width 52% SVL; in dorsal view, snout ovoid, in lateral view sloping slightly; snout deep; canthus rostralis straight, represented by a crest; nostrils not protuberant, directed dorsolaterally; loreal region almost flat, sloping gradually to upper lip; upper eyelids tuberculate, one tubercle long and pointed; interorbital space broad, concave; well-developed crests on frontoparietals and on squamosal (above tympanum); tympanum superficial, prominent, higher than long; supratympanic fold indistinct dorsally, evident behind tympanum; postrictal tubercles small, not conical; skin of head smooth excepting upper eyelids and a few little-elevated tubercles posterior to eyes (the anterior ends of the suprascapular folds); skin of throat smooth; choanae large, well away from palatal shelf of maxillary arch; vomerine odontophores prominent, median and posterior to choanae, each having a row of 6-7 teeth; odontophores separated medially by a distance equal to one fourth or one third width of an odontophore; tongue longer than wide, posterior one third not adherent to flor of mouth.

Skin of dorsum smooth (actually very finely granular) with indistinct paravertebral folds; folds sinuous (space between folds narrow in scapular region, broad in sacral region, narrow above pelvic girdle); a row of separated tubercles on flanks (extending from vicinity of tympanum to groin); flanks covered with warts; skin of venter smooth.

Forearm bearing indistinct ulnar fold which contains one or two small tubercles on its dorsal surface; inner metacarpal (thenar) tubercle elongate, outer (palmar) larger, less distinct, not bifid; palmar supernumerary tubercles indistinct; subarticular tubercles slightly elevated, slightly longer than wide; fingers lack lateral fringes or folds; tips of fingers with small discs (these are probably artifacts because one cannot see a circumferential groove at the tip of the digit; however, the specimen is somewhat desiccated); order of lengths of fingers (longest to shortest) III - I - IV - II.

Dorsal surfaces of hind limbs more rugose than other dorsal surfaces; thighs with some tubercles, shanks with smaller tubercles and thin folds; two or three very small tubercles on the lateral edge of tarsus; no fold on inner edge of tarsus; inner metatarsal tubercle elongate and laterally compresed, outer metatarsal tubercle flat, little evident; no supernumerary plantar tubercles; subarticular tubercles not conical, longer than wide; toes lack lateral folds and webbing; tips of toes with narrow discs.

Coloration. Reddish-brown above with black lines the length of the paravertebral folds; a series of dark spots along the lenght of the upper lip;

black spot behind tympanum; a few black spots (small) on the flanks; ventral surfaces yellow suffused with brown; posterior surfaces of thighs dark brown with small yellow spots (spots of a size equal to one-half the size of a disc of a toe).

Measurements of the holotype in milimeters: SVL; 40.6; tibia 19.6-19.7; head width 21.1; head length 16.0; chord of head length 18.7; width of upper eyelid 3.3-3.3; interorbital distance 4.7; length of tympanum 2.9-3.2; length of eye 4.9-4.6; distance between eye and nostril 4.1-4.7. For bilateral measurements, each side is recorded (left-right).

OSTEOLOGY

There is only a single individual known of *E. cadenai*. This individual, although slightly desiccated, permits the observation of some characteristics of the craneum. The skull was exposed through partial dissection (the skin was reflected and some muscles of the adductor series were removed in order to see bones and nerves on the left side of the skull). During dissection, I noted that the mandibular ramus of the trigeminal nerve passes laterally to the adductor series of the mandibular mucles.

Eleutherodactylus cadenai has a highly modified skull. The frontoparietals have lateral crests (the margins are elevated forming a depression, shallow anteriorly, deeper posteriorly). Posteriorly, each crest has a projection extending laterally-this flange has projections anteriorly and posteriorly. The dorsal surfaces of the frontoparietals are very rugose (the texture derives from the small papillae of bone on the surface). The from of the cranial crest is very similar to those of *E. ruizi* (Lynch, 1981).

The bones of the maxillary arch are modified with superficial exostosis and expansion of the bones, forming extensive sutures between all bones of the maxillary arch, nasals, and squamosals. This modification (Fig. 1) is most impressive in the region of the cheek (anterior to the tympanum). The maxilla extends posteriorly and posterodorsally forming a suture with the zygomatic process of the squamosal. Also, the quadratojugal extends dorsally forming a suture with the zygomatic process. The zygomatic and otic processes of the squamosal are exostosed, forming a squamosal crest. The ascending and zygomatic processes of the squamosal along with the quadratojugal form the limits of a fenestrum which lies anterior to the ascending process of the squamosal. The otic process of the squamosal has a medial extension onto the crista parotica; this extension reaches halfway of the distance between the squamosal crest and the epiotic eminence.

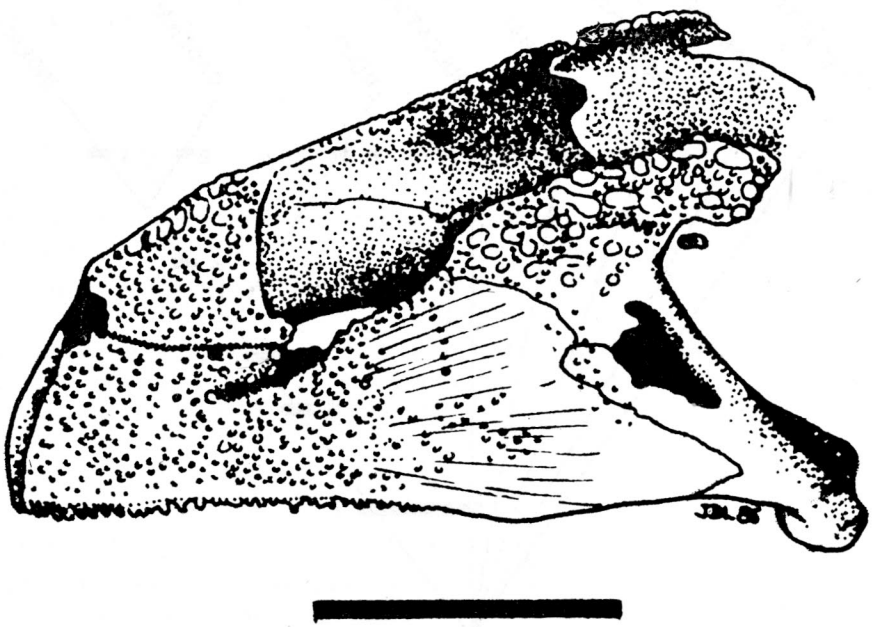

FIGURE 1. Lateral view of skull of *Eleutherodactylus cadenai* (ICN No. 13731, holotype). Scale equals 5 mm.

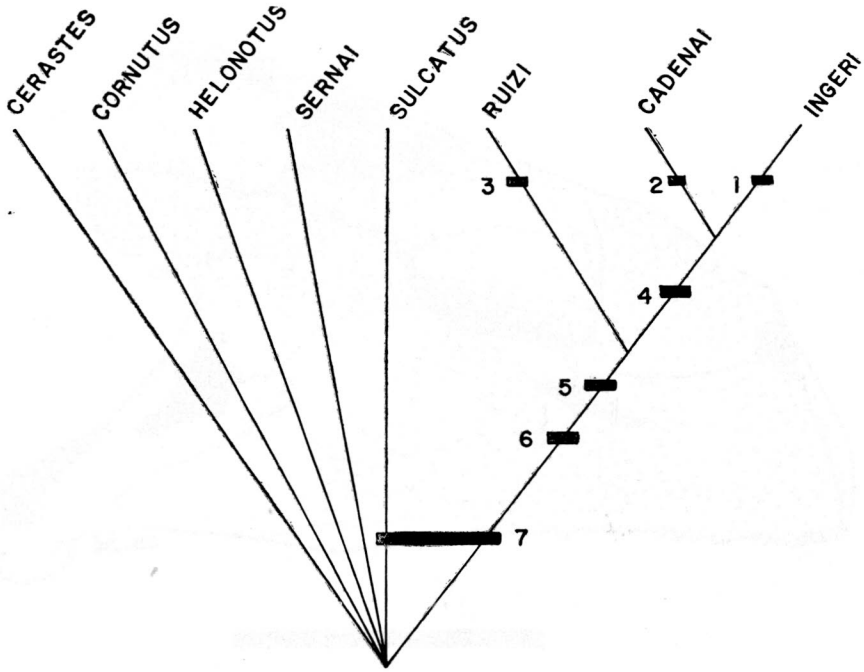

FIGURE 2. Cladogram of the species of the *sulcatus* group. Autapomorphies and synapomorphies are (1) narrowly separated cranial crests; (2) exostosis with bony papillae; (3) partial temporal arch; (4) bony cheek; (5) zygomatic process extending anteroventrally toward maxilla; (6) squamosal crests; (7) otic process of squamosal extending medially above the crista parotica.

DISCUSSION

The hypothesis of relationships proposed here (Fig. 2) is that *E. cadenai* is the sister species of *E. ingeri*. This hypothesis is based on the observation that these two species share the same morphology (osteologically) of the cheek. The characteristic is proposed as a synapomorphy of the two species. This pair of species forms a group with *E. ruizi*. These three species have the same modification of the zygomatic process of the squamosal as well as sharing the state of having squamosal crests. This set of three species is a subset of the *sulcatus* group. The relationships with the other five species are unknown at this time.

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